

ART. XII.—Recent Foraminifera from Barwon Heads, Victoria.

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Introduction.

Up to the present, only one paper, the well-known one by Mr. Frederick Chapman in the Journal of the Quekett Microscopical Club for 1907, has been published giving a general account of the foraminifera found on the coast of Victoria. While Mr. Chapman's work has been supplemented by descriptions given of a number of species by the present writer, either alone or in

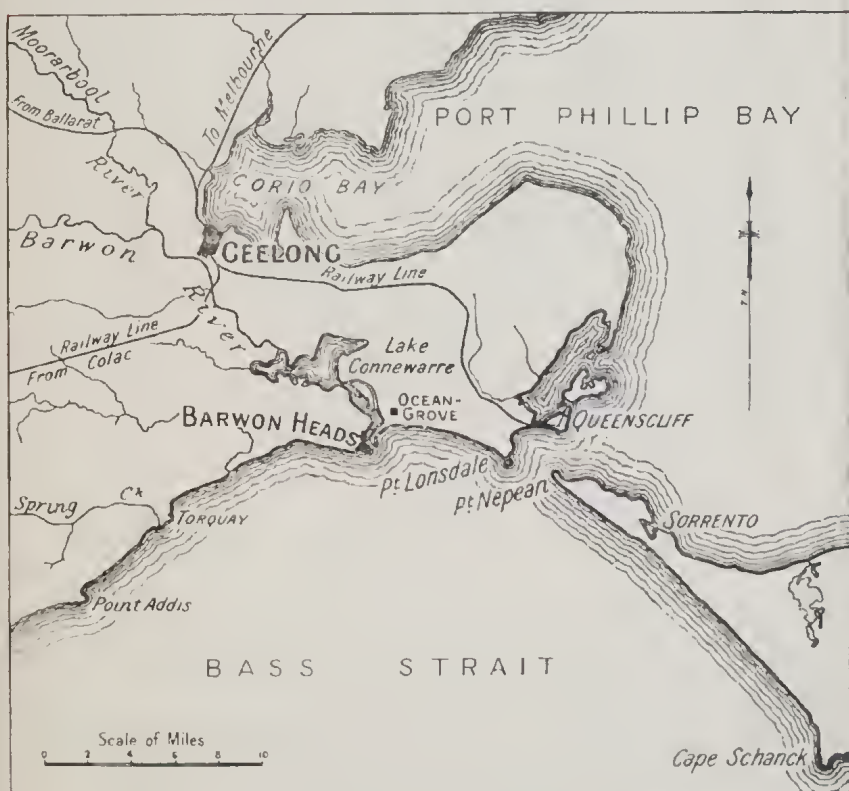


FIG. 1.—Locality Plan of Barwon Heads District.

collaboration with Mr. A. C. Collins, in papers published in this Journal during the years 1930, 1932, and 1937, it has for some time been evident that there are still many new or unrecorded foraminifera occurring in Victorian waters. Practically all of these were found in a number of shore gatherings made at Barwon Heads over a period extending from 1932 until 1943 by Mr. W.

Baragwanath, the Director of the Geological Survey of Victoria, and his daughter, Miss Betty Baragwanath, and kindly made available to me. Apart from the occurrence in the gatherings of practically all of the previously recorded species from Victoria, they provide so much new information on our coastal foraminifera that the following notes have been prepared.

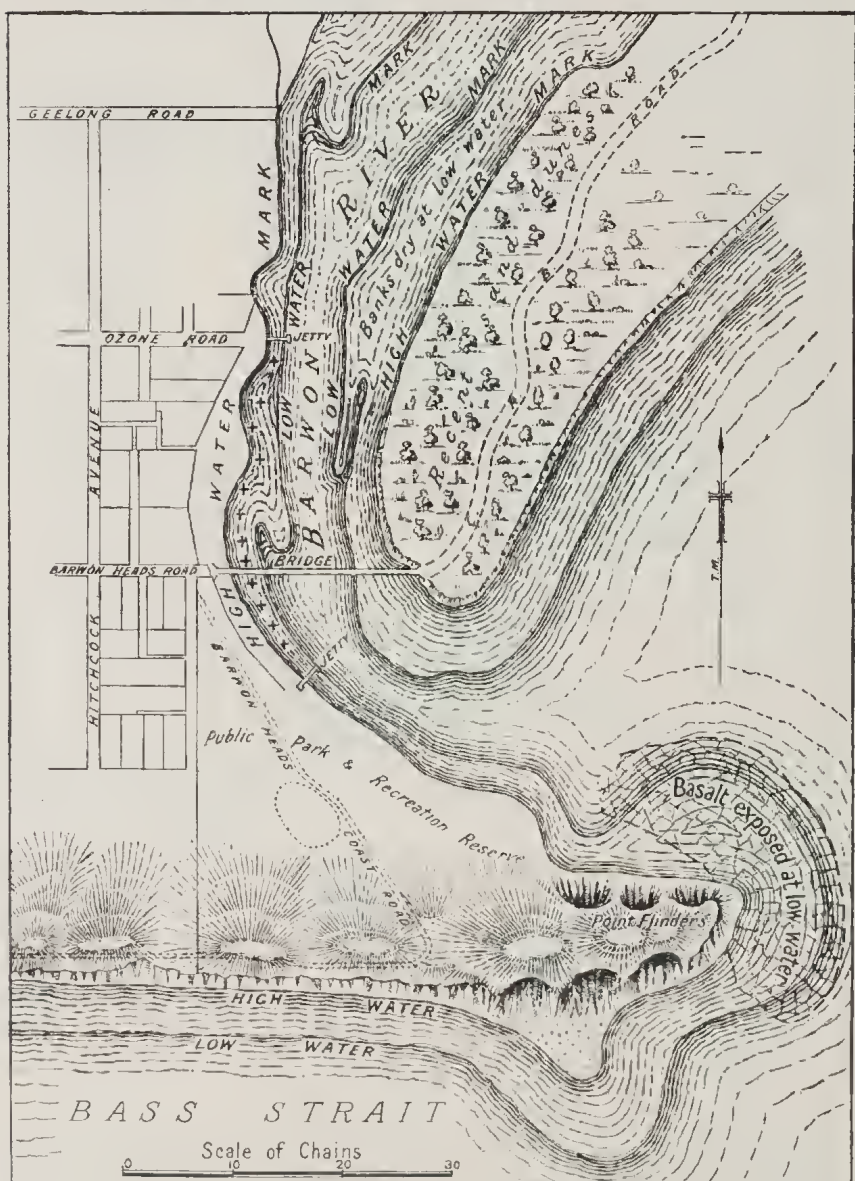


FIG. 2.—Sketch Map of Barwon Heads, showing area from which collections were made indicated thus +.

The township of Barwon Heads is situated on the west side of the mouth of the Barwon River, about six miles west of the entrance to Port Phillip Bay. Between the township and the shores of Bass Strait is the mass of dune limestone, resting on Older Basalt, known as Mt. Colite, which rises conspicuously above the sand dunes which extend for many miles on either side along the coast.

Inland, the Barwon River widens to form Lake Connemara, on the northern shores and part of the floor of which are deposits of fossiliferous marls of Middle Miocene age. These deposits extend seawards and outcrop on the sea floor at Ocean Grove, a little north-east of the mouth of the Barwon River.

The Barwon River is subject to tidal influence up to a point above the head of Lake Connemara and the material collected by Mr. Baragwanath has been deposited by the tide on the sandy beach which forms the west bank of the river over a distance of from 20 to 30 chains inland from its mouth.

As might be expected with material collected over so many years and under varying conditions of weather and tide, there is some difference in the number and variety of the foraminifera present in the various gatherings. While the decision to describe the foraminifera was made so late that those from each gathering were not kept separate with a record of the conditions prevailing at the time of collection, it can be stated that, with the following exceptions, the species in each gathering, while varying in abundance, were the usual forms occurring on a sandy bottom in shallow water on the Victorian coast. On one occasion, specimens of *Tretomphalus*, which had clearly drifted in from the open sea, occurred in great numbers, while, on another, numerous examples of a new species of *Webbinella*, an adherent genus, which was not found in any other gathering, were met with. Two or three gatherings were noteworthy for the occurrence of many exceptionally fine specimens of the rare genus *Delosina*, which has since found to be widely distributed in Bass Strait.

A source of difficulty in dealing with the foraminifera has been the presence in the gatherings of fossil species derived from the Tertiary deposits to which reference has been made. These fossil foraminifera are usually so perfectly preserved that their appearance does not differ from that of Recent specimens and they can accordingly only be distinguished by comparison with those occurring in the local Tertiary deposits. After excluding

all fossil and doubtful species, the number of forms recognized as of Recent origin is 142, including 14 which are described as new. To avoid the necessity of giving the synonymy of every species, references to literature are given only when the species has not been previously sufficiently dealt with in publications which are readily available. With these exceptions, the references will be found in one of the following publications:—

- BRADY, H. B., 1884.—Report on the foraminifera dredged by H.M.S. "Challenger" during the years 1873-1876.—Rep. Voy. *Challenger*, Zoology, vol. 9.
- CHAPMAN, F., 1907.—Recent Foraminifera of Victoria: Some Littoral Gatherings. *Journ. Quckett Micr. Club*, ser. 2, vol. 10, pp. 117-146, pls. 9, 10.
- CUSHMAN, J. A., 1918-1931.—The Foraminifera of the Atlantic Ocean. *U.S. Nat. Mus.*, Bull. 104, pts. 1-8.
- PARR, W. J., 1932.—Victorian and South Australian Shallow-Water Foraminifera, Part I. *Proc. Roy. Soc. Vic.*, n.s. 44 (1), pp. 1-14, pls. 1, 2; Part II. *Ibid.*, pt. 2, pp. 218-234, pls. 21, 22.
- PARR, W. J., and COLLINS, A. C., 1937.—Notes on Australian and New Zealand Foraminifera. No. 3. Some Species of the Family Polymorphinidae. *Proc. Roy. Soc. Vic.*, n.s. 50 (1), pp. 190-211, pls. 12-15.

It may be noted here that I now believe that the species recorded in my 1932 papers as being from "Williamstown. Silty mud. (Collected many years ago by the late J. Gabriel)" were not of Recent origin, but were from fine washings, of Middle Miocene age, from one of the bores put down in the Williamstown district in search of brown coal. The specimens of *Discorbis margaritifera* recorded at the same time from shore sand, Point Lonsdale, are also now regarded as being from the Middle Miocene deposits in the vicinity of Ocean Grove. Examples of this species occur commonly in the Barwon Heads shore gatherings, where there can be no doubt of their fossil origin.

To Mr. and Miss Baragwanath, I desire to express my sincere thanks for collecting and making the material available for examination. The assistance of Mr. Arthur Kennedy, of the Mines Department, who made the drawings illustrating the paper is also gratefully acknowledged. I am also indebted to Dr. M. F. Glaessner for his advice on the identification of several of the species.

The types and other specimens are in the writer's collection, and will later be deposited in the National Museum, Melbourne.



## Systematic List of Species.

### Family AMMODISCIDAE.

1. *AMMODISCUS MESTAYERI* Cushman (Pl. VIII., figs. 1, 2).

*A. mestayeri* Cushman, 1919, Proc. U.S. Nat. Mus., 56, p. 597, pl. 74, figs. 1, 2.

This species is represented by ten small examples. It was described from off the Poor Knights Islands, off the east coast of New Zealand, and is stated by Cushman to be distinguished by its few coils and protuberant proloculus.

### Family SACCAMMINIDAE.

2. *PROTEONINA SPICULIFERA* Parr (Refs., Parr, 1932, p. 218).

Two specimens similar to those previously figured by the writer from Point Lonsdale, Victoria. The form and wall structure of the test of this species suggest that it may be merely the detached chambers of *Reophax distans*, var. *pseudodistans*, which, like the preceding species, was described by Cushman from off the Poor Knights Islands. No specimens showing an opening at both ends or consisting of more than one chamber have, however, been found and, in the absence of these, the reference to *Protconina* is retained.

3. *WEBBINELLA BASSENSIS*, sp. nov. (Pl. VIII., figs. 3a-c).

Test adherent, plano-convex, circular in outline, usually with a slight rim around the base; chamber single, undivided, consisting of a hemisphere of chitin which supports the weakly-cemented wall of very fine particles of quartz; dorsally the wall is thin, but it thickens towards the base, where in addition to forming the marginal flange it extends underneath for a short distance to cover part of the chitinous floor; no general aperture; colour very pale fawn. Diameter, 0.5 mm.

There are over 80 specimens, all of which are detached from the object to which they were adherent during life. The present occurrence appears to be unique, as the genus usually occurs in small numbers in comparatively deep water attached to stones and shell fragments. The appearance of the Barwon Heads specimens suggests that they were adherent to marine algae. Usually the chitinous lining is preserved and the protoplasmic body has in many cases collected into a brown, rounded mass on the transparent floor of the test.

*W. bassensis* does not closely resemble any previously described species of *Webbinella*. For assistance in its identification, I am indebted to Mr. Edward Milton, F.R.M.S., of Torquay, England, who has also kindly forwarded examples of an undescribed English Recent species of *Webbinella* for comparison.

## Family LITUOLIDAE.

4. HAPLOPHRAGMOIDES CANARIENSIS (d'Orbigny) (Refs., Cushman, 1920, p. 38).

There are seven examples of the normal form of this species.

## Family TEXTULARIIDAE.

5. TEXTULARIA SAGITTULA Defrance (Refs., Brady, 1884, p. 361).

Four typical specimens.

6. TEXTULARIA CONICA d'Orbigny (Refs., Cushman, 1922, p. 22).

A typical example.

7. TEXTULARIA PSEUDOGRAMEN Chapman and Parr.

*T. gramen* Brady (*non* d'Orbigny), 1884, p. 365, pl. 43, figs. 9, 10. Cushman, 1924, Carnegie Inst. Washington Publ. No. 342, p. 15, pl. i., figs. 7, 8.

*T. pseudogramen* Chapman and Parr, 1937, Aust. Antarctic Expedn., 1911-14 Sci. Repts., Ser. C, vol. I., pt. 2, p. 153.

Several examples. This species is common in Bass Strait. As a holotype was not designated when it was described, I now select the original of fig. 9 of Plate 43 of the "Challenger" Report as the type specimen. This was from "Challenger" Stn. 162, off East Moncoeur Island, Bass Strait, 38-40 fms.

## Family TROCHAMMINIDAE.

8. TROCHAMMINA INFLATA (Montagu) (Pl. VIII., figs. 4a, b). (Refs., Brady, 1884, p. 338.)

Many typical specimens. *T. inflata* is one of the group of foraminifera which will tolerate brackish water, and on the Victorian coast it appears to be most at home under these conditions, as it is common at the mouth of Kororoit Creek, near Williamstown, and at the mouth of the Barwon River, but is rare elsewhere.

## Family VALVULINIDAE.

9. CLAVULINA MULTICAMERATA Chapman (Refs., Parr, 1932, p. 4).

One specimen. This species is usually more common in Victorian shore sands.

10. EGGERELLA sp. (Pl. VIII., fig. 5).

The only specimen found is probably a new species, but more material is required to determine this. The characters of the specimen, which has a length of 0.35 mm., are shown by the figure. The test, except for the final chamber which is white, is warm brown in colour.

Family VERNEUILINIDAE.

11. GAUDRYINA (PSEUDOGAUDRYINA) HASTATA Parr.

*G. hastata* Parr, 1932, p. 219, pl. 22, figs. 40 a, b,

*G. (P.) hastata*: Cushman, 1937, Cushman Lab. Spl. Publ. No. 7, p. 95, pl. 14, figs. 7, 8.

Several worn examples.

Family OPTHALMIDIIDAE.

12. PLANISPIRINA (?) BUCCULENTA (Brady) (Pl. XII., figs. 1a, b).

*Miliolina bucculenta* Brady, 1884, p. 170, pl. 114, figs. 3 a, b.

*Planispirina bucculenta*: Schlumberger, 1892, Mém. Soc. Zool. France, 5, p. 208, text-figs. 2-4, pl. 8, figs. 6, 7.

There are several examples which, in external characters, are close to Schlumberger's figs. 6 and 7, as well as a number of smaller, irregular, biloculine specimens. This species, which was described from deep water in the North Atlantic, has, at different times, been referred to "*Miliolina*," *Planispirina*, and *Triloculina*, but Schlumberger's figures of sectioned specimens show that the internal structure is not the same as that of any of these genera. Wiesner (1931, Deutsche Südpolar Expedn. 1901-1903. XX. Zool., p. 107, pl. 15, fig. 178) has figured what appears to be this species under the name of *Miliolinella subrotunda* (Montagu), var. *trigonina* Wiesner. The genotype of *Miliolinella*, a genus described by Wiesner in the same work, is *Vermiculum subrotundum* Montagu, the internal structure of which is not fully known, but the megalospheric form, as figured by Sidebottom (1904, Mem. Proc. Manchester Lit. Phil. Soc., vol. 48, No. 5, p. 8, text-fig. 2) from the Eastern Mediterranean, shows a resemblance to the stages following the central disc of the microspheric form of *P.?* *bucculenta* as figured by Schlumberger. Until the growth stages of the microspheric form of *M. subrotunda* are known, the position of *Miliolinella* is uncertain and I have accordingly referred Brady's species doubtfully to *Planispirina* to which the information available suggests that it is most closely related.

13. NUBECULARIA LUCIFUGA Defrance (Refs., Brady, 1884, p. 134).

Several small examples.

## Family MILIOLIDAE.

14. *QUINQUELOCULINA DILATATA* d'Orbigny (Refs., Cushman, 1929, p. 26).

There are several examples of this West Indian species.

15. *QUINQUELOCULINA LAMARCKIANA* d'Orbigny (Refs., Cushman, 1929, p. 26).

In his notes on this West Indian species, Cushman states that, in the West Indies, there are two forms which may possibly be distinct. Both have a smooth surface, but in one the peripheral angle is acute and the surface smooth and polished, while in the other the peripheral angle is usually more blunt and the surface dull. The Barwon Heads specimens are similar to the second form. This is common on the Victorian coast.

16. *QUINQUELOCULINA SUBPOLYGONA*, sp. nov. (Pl. XII., figs. 2a-c).

Test about  $1\frac{1}{2}$  times as long as broad; chambers distinct; sutures slightly depressed; each chamber polygonal in cross-section, the periphery concave, usually with a projecting, sometimes undulate, carina at either angle; apertural end extended into a short neck, aperture more or less quadrate, with an everted lip and a single bifid tooth; surface dull.

Length 1.0 mm., breadth, 0.6 mm., thickness, 0.4 mm.

This is the commonest species of the genus on the south coast of Australia. It has been confused with *Q. polygona* d'Orbigny, from the West Indies, but has a shorter, more strongly carinate test than that species and is also less regularly built. Another species which resembles *Q. subpolygona* is *Q. sulcata* d'Orbigny, as figured by Cushman (1932, U.S. Nat. Mus., Bull. 161, p. 28, pl. 7, figs. 5-8) from off Fiji. This is proportionately much longer and the apertural end is extended to form a long neck.

17. *QUINQUELOCULINA BARAGWANATHI*, sp. nov. (Pl. VIII., figs. 6a-c; Pl. XII., fig. 3).

Test a little longer than broad, of rather irregular form; periphery subacute; chambers distinct, only moderately inflated; sutures depressed; surface matte, frequently ornamented by short, obliquely curved costae (1 or 2 to a chamber) extending inward from the peripheral angle and sloping toward the apertural end of the chamber; aperture semi-circular, with an everted lip and a flat, semi-circular tooth which is placed in front of the aperture.

Length 0.6 mm., breadth, 0.4 mm., thickness, 0.25 mm.



This is also a common species on the south coast of Australia, and I have specimens from shallow water, near Noumea, New Caledonia. Chapman's record (1907, p. 124) of "*Miliolina*" *undosa* (Karrer) from Torquay, Victoria, probably refers to the same form, but the Recent records of Karrer's species usually relate to a form with a produced apertural neck and a plate-like, sometimes bifid, tooth in the aperture.

18. *QUINQUELOCULINA COSTATA* d'Orbigny (Refs., Parr, 1932, p. 8).

Examples are common.

19. *SPIROLOCULINA ANTILLARUM* d'Orbigny (Refs., Parr, 1932, p. 9).

One specimen. The Southern Australian examples of this species attain a greater development than those from the West Indies.

20. *SPIROLOCULINA MILLETTI* Wiesner.

*S. nitida* Brady (*non* d'Orbigny), 1884, p. 149, pl. 9, figs. 9, 10.  
Millett, 1898, J. R. M. S., p. 265, pl. 5, figs. 9-13.

*S. milletti* Wiesner, 1912, Archiv f. Protistenkunde, 25, p. 207.  
Cushman, 1917, U.S. Nat. Mus., Bull. 71, Pt. 6, p. 33, pl. 5, fig. 4. Wiesner, 1923, Die Miliolideen der östlichen Adria, p. 30, pl. 4, figs. 7, 8.

Fine specimens similar to those figured by Brady are frequent. They are more regularly formed than those figured by Millett from the Malay Archipelago.

21. *SPIROLOCULINA LIMBATA* d'Orbigny (Refs., Cushman, 1929, p. 44).

Many large specimens.

22. *SIGMOILINA AUSTRALIS* (Parr).

*Quinqueloculina australis* Parr, 1932, p. 7, pl. 1, figs. 8a-c.

This species was described by the writer from 7 miles E. of Cape Pillar, Tasmania, 100 fms., and recorded also from shore sand, Point Lonsdale, Victoria, and elsewhere. I am indebted to Mr. Arthur Earland, F.R.M.S., for drawing my attention to the fact that it should be referred to *Sigmoilina*.

23. *TRILOCULINA TRIGONULA* (Lamarck) (Refs., Cushman, 1929, p. 56).

Examples are common. They are of the large, strongly inflated form which occurs so frequently on the coasts of Victoria and South Australia.

## 24. TRILOCULINA STRIATOTRIGONULA Parker and Jones.

*T. striatotrigonula* Parker and Jones, 1865, Phil. Trans. Roy. Soc., 155, p. 438 (*nomen nudum*).

*Miliolina insignis* Brady, 1884, pl. 4, fig. 10 (*non* fig. 8).

*T. insignis* Parr, 1932, p. 11, pl. 1, fig. 19.

*T. striatotrigonula*: Parr, 1941, Mining and Geol. Journ., 2 (5), p. 305.

Small specimens. The reasons for the use of this name instead of *T. insignis* (Brady) are given in the last reference quoted.

## 25. TRILOCULINA TERQUEMIANA (Brady) (Ref., Brady, 1884, p. 166).

There is one example of this striate form of *T. tricarinata*.

## 26. TRILOCULINA OBLONGA (Montagu) (Refs., Parr, 1932, p. 10).

Examples are rather common. In addition to the narrow form figured by Williamson, there are some broader specimens and two of the biloculine type I have figured from Point Lonsdale, Victoria.

## 27. TRILOCULINA CIRCULARIS Bornemann, (Refs., Cushman, 1929, p. 58).

Typical specimens are very common.

28. TRILOCULINA CIRCULARIS Bornemann, var. *sublineata* (Brady).

(Refs., Brady, 1884, p. 169.)

Brady described this form from off the Admiralty Islands, on the north coast of New Guinea, 15-25 fms. As figured by him, it has no apertural tooth or plate, but the Victorian specimens have a fairly large, flat, semi-circular tooth in front of the aperture. There are also more compressed and the chambers are not so inflated. Possibly they represent a new species.

## 29. TRILOCULINA LABIOSA d'Orbigny (Refs., Parr, 1932, p. 220). Common.

30. TRILOCULINA LABIOSA d'Orbigny, var. *schauinslandi* (Rhumbler).

(Refs., Parr, 1932, p. 220.)

Examples are very common.

## 31. TRILOCULINA BASSENSIS, sp. nov. (Pl. VIII., figs 7 a-c).

Test longer than broad, triloculine, typically with a truncate periphery which in the final chamber is frequently keeled on each edge; chambers distinct; sutures slightly depressed; surface covered with very short, delicate ridges which give a matte effect; aperture subquadrate, longer than wide, with an everted lip and an elongate tooth which is thicker at the inner end.

Length, 0.75 mm., breadth, 0.6 mm., thickness, 0.37 mm.

In many respects, this species resembles *Quinqueloculina subpolygona*, but is triloculine and smaller than the latter. It may also be compared with *Triloculina irregularis* (d'Orbigny), as figured by Cushman (1932, U.S. Nat. Mus., Bull. 161, Pt. 1, p. 54, pl. 12, figs. 2 a-c) from off Fiji, 40-50 fms. In this species, the test in transverse section is almost rectangular, but in *T. bassensis* it is roughly triangular, because, unlike the Fijian species, the outer truncate margin of the penultimate chamber is in a plane oblique to that of the final chamber.

32. *PYRGO DENTICULATA* (Brady) (Refs., Cushman, 1929, p. 69).

Several specimens.

33. *NEVILLINA CORONATA* (Millett) (Pl. VIII., figs. 8 a, b).

*Biloculina coronata* Millett, 1898, J.R.M.S., p. 263, pl. 6, figs. 6a-c.

*Nevillina coronata*: Sidebottom, 1905, Mem. Proc. Manchester Lit. Phil. Soc., 49 (11), pp. 1-4, pl.

There are eight examples of what appears to be the biloculine or *Pyrgo* stage of this species. They attain a length of 0.9 mm. and closely resemble Millett's figures and Sidebottom's figures 5 and 6. I have similar specimens from off Masthead Island, in the Capricorn Group, off the coast of Queensland, 20 fms. The adult stage, in which the test is unilocular, has not been met with and has apparently been recorded only by Sidebottom, whose specimens were from off the Andaman Islands, 16 fms., and Sulu roadstead, 12 fms.

Family SORITIDAE.

34. *PENEROPLIS PLANATUS* (Fichtel and Moll).

*P. planatus*: Cushman, 1933, U.S. Nat. Mus., Bull. 161, Pt. 2, p. 61, pl. 19, figs. 1-3 (gives refs.).

*P. pertusus* Parr (non *Nautilus pertusus* Forskal), 1943, Malac. Soc. Sth. Aust. Publ. No. 3, p. 22.

Three worn examples. This was previously incorrectly recorded from Barwon Heads by the writer as *P. pertusus*.

Family SPIRILLINIDAE.

35. *SPIRILLINA VIVIPARA* Ehrenberg (Refs., Cushman, 1931, p. 3).

Two specimens.

36. *SPIRILLINA INAEQUALIS* Brady (Refs., Brady, 1884, p. 631).

There are many examples of this well-known Indo-Pacific form.

37. *SPIRILLINA DENTICULOGUANULATA* Chapman (Refs., Chapman, 1907, p. 133).

This species was described from shore sand, Torquay, Victoria, and is here represented by seven examples. It is probably the same as Brady's *S. limbata*, var. *denticulata*, from off East Moncoeur Island, Bass Strait, 38 fms. Brady has figured only one side of his specimen and, in the writer's opinion, based on the examination of many specimens of *Spirillina* from Bass Strait, the figure represents the dorsal aspect of an asymmetrical form identical with Chapman's species.

38. *SPIRILLINA DENTICULOGUANULATA* Chapman, var. *pulchra*, var. nov. (Pl. VIII., figs. 9 *a-c*; Pl. IX., figs. 1 *a-c*).

Variety differing from the typical form of the species in the more numerous whorls and greater number of more delicate tooth-like processes on the dorsal side. Diameter, 0.45 mm.

This form is represented by several specimens. A typical example and what is probably a weakly developed specimen of the same variety are figured. It is intermediate between *S. denticuloguanulata* and an undescribed species occurring in the Middle Miocene at Muddy Creek, Victoria, in which the tooth-like processes are absent.

39. *SPIRILLINA RUNIANA* Heron-Allen and Earland (Pl. IX., figs. 2 *a, b, 3*).

*Spirillina vivipara* Ehrenberg, var. *runiana* Heron-Allen and Earland, 1930, J.R.M.S., p. 179, pl. 4, figs. 51-53.

Four specimens. This form, which appears to be specifically distinct from *S. vivipara*, was described from off Plymouth, England, from a depth of about 30 fms.

#### Family NODOSARIIDAE.

40. *LENTICULINA* sp.

Several weak specimens of the *L. gibba* group.

41. *VAGINULINA VERTEBRALIS* Parr (Refs., Parr, 1932, p. 221).

Three specimens similar to that described by the writer from shore sand, Torquay, Victoria.

42. *VAGINULINA BASSENSIS*, sp. nov. (Pl. XII., figs. 4 *a, b*).

Test elongate, tapering, somewhat lobulate on the ventral side, compressed in the early stages, later becoming almost circular in transverse section; chambers distinct, increasing in height comparatively quickly, sometimes showing traces of coiling in the

early stages but usually added obliquely at an angle of about 45 deg., or more, with the amount of inflation increasing gradually; sutures distinct, later ones depressed; wall smooth, translucent; aperture eccentric, on the dorsal side, radiate. Length up to 1.5 mm.

There are numerous specimens. This is a puzzling species in several respects. It is not sufficiently compressed to be a typical *Uaginulina* but is nearer this genus than any other. The smaller, less developed specimens resemble some of the open-coiled species of the "*Cristellaria*" *crepidula* group, while a few of the larger examples would be referred to *Dentalina inornata* if found alone. The large series of specimens shows, however, that only one species is present.

#### 43. DENTALINA INORNATA d'Orbigny.

*D. inornata* d'Orbigny, 1846, For. Foss. Vienne, p. 44, pl. 1, figs. 50, 51. Chapman and Parr, 1937, Aust. Ant. Exped. 1911-14, Sci. Repts. [C.], I. (2), p. 60.

One specimen. This species is better known as *D. communis* d'Orbigny. The reasons for the disuse of this name are given in the reference by Chapman and Parr, quoted above.

#### 44. DENTALINA MUTSUI Hada (Pl. XII., fig. 5).

*D. mutsui* Hada, 1931, Sci. Repts. Tohoku Imp. Univ., Ser. 4, Biology, 6 (1), p. 97, text-fig. 50.

I have referred to this species, which was described from Mutsu Bay, Japan, 15-25 fms., a form of *Dentalina* which is very common at Barwon Heads. Except that they attain a length of 2 mm. as against 3.65 mm. in the Japanese examples, the specimens agree with Hada's description and figure.

#### 45. DENTALINA GUTTIFERA d'Orbigny.

*D. guttifer* d'Orbigny, 1846, Foram. Foss. Vienne, p. 49, pl. 2, figs. 11-13.

*Nodosaria pyrula* Brady (non d'Orbigny), 1884, p. 497, pl. 62, figs. 10-12 (and later authors).

One broken specimen.

#### 46. NODOSARIA SCALARIS (Batsch) (Refs., Brady, 1884, p. 510).

Several examples.

#### 47. FRONDICULARIA COMPTA Brady, var. *villosa* Heron-Allen and Earland (Pl. IX., fig. 4).

*F. archiaciana* Brady (non d'Orbigny), 1884, p. 520, pl. 114, fig. 12.

*F. compta* Brady, var. *villosa* Heron-Allen and Earland, 1924, J.R.M.S., p. 157, pl. 10, figs. 54-55.

Two specimens. This appears to be the only Recent record of this form other than those of Brady and of Heron-Allen and Earland from off Raine Island, 155 fms. The last-named authors also had it from the Miocene of Batesford, Victoria.



48. *LAGENA LAEVIS* (Montagu).

*Vermiculum laeve* Montagu, 1803, Testacea Britannica, p. 524.

*Lagena vulgaris* Williamson, 1858, Recent Foram. Gt. Britain, p. 3, pl. 1, figs. 5, 5a.

The specimens are not typical, resembling fig. 14 of Pl. 56 of the "Challenger" Report.

49. *LAGENA PERLUCIDA* (Montagu) (Refs., Cushman, 1923, p. 46).

The specimens are finely costate on the basal end.

50. *LAGENA STRIATA* (d'Orbigny) (Refs., Cushman, 1923, p. 54).

Typical specimens of the original globular type.

51. *LAGENA SULCATA* (Walker and Jacob) (Refs., Cushman, 1923, p. 57).

Good examples are common.

52. *LAGENA ACUTICOSTA* Reuss (Refs., Cushman, 1923, p. 5).

The specimens have more costae (18-20) than in the typical form of this species.

53. *LAGENA ACUTICOSTA* Reuss, var. *ramulosa* Chapman (Refs., Parr, 1932, p. 11).

This Southern Australian form of *L. acuticosta* is common in most Victorian shore gatherings.

54. *LAGENA GRACILLIMA* (Seguenza) (Refs., Cushman, 1923, p. 23).

The specimens are all spirally twisted, and may be merely a smooth form of *L. distoma-margaritifera*.

55. *LAGENA DISTOMA-MARGARITIFERA* Parker and Jones (Refs., Parr, 1932, p. 11).

This beautiful species is common.

56. *LAGENA DISTOMA-MARGARITIFERA*, var. *victoriensis*, nov. (Pl. XII., fig. 6).

Test elongate, usually spirally twisted, fusiform with the aboral end pointed and the apertural end extended into a long neck which terminates in a phialine lip; surface ornamented with from eight to ten strong costae.

Length up to 1.5 mm.

This form is common in Victorian shore sands. Its shape is similar to that of *L. distoma-margaritifera*, with which it is always associated, and it appears to be only a costate modification of that species. The twisted and costate test distinguish it from *L. distoma* Parker and Jones.

57. *FISSURINA LUCIDA* (Williamson) (Refs., Cushman, 1923, p. 33).

One specimen.

58. *FISSURINA BIANCAE* Seguenza.

*F. laevigata* Reuss, 1849 (*non Oolina laevigata* d'Orbigny), Denkschr. Akad. Wiss. Wien, 1, p. 366, pl. 46, fig. 1.

*F. biancae* Seguenza, 1862, Foram. Monot. Marne Miocen. Distretto Messina, p. 57, pl. 1, figs. 48-50.

*Lagena biancae*: Heron-Allen and Earland, 1932, Discovery Repts., 4, p. 372, pl. 10, figs. 35-39.

One good example. This species has frequently been recorded under the name of *Lagena laevigata* (Reuss) which is pre-occupied by an earlier species described by d'Orbigny.

59. *FISSURINA SUBQUADRATA*, sp. nov. (Pl. IX., figs. 5 *a*, *b*).

Test much compressed, subquadrate in outline, periphery bluntly carinate; surface with two shallow grooves on each face, parallel to the outside margin and almost meeting at the base; aperture fissurine, extending almost the full width of the test, and opening into a centrally placed entosolenian tube.

Length, 0.4 mm.

Two specimens. *F. quadrata* (Williamson), which this species resembles in many respects, has the apertural end produced into a short neck and the faces of the test are not grooved.

60. *FISSURINA LACUNATA* (Burrows and Holland).

*Lagena castrensis* Brady (*non* Schwager), 1884, p. 485, pl. 60, figs. 1, 2.

*L. lacunata* Burrows and Holland, in Jones, 1895, Pal. Soc., vol. for 1895, p. 205, pl. 7, figs. 12 *a*, *b*.

There are many specimens similar to Brady's fig. 1, which was from Bass Strait. In *F. castrensis*, the faces of the test are beaded and not pitted as in *F. lacunata*.

61. *FISSURINA CONTUSA*, sp. nov. (Pl. IX., fig. 6).

*Lagena castrensis* (?) Brady (*non* Schwager), 1884, pl. 60, fig. 3.

Test compressed, the central body portion nearly circular, apertural end slightly extended, periphery with a moderately sharp keel which surrounds the test and on either side of which is a secondary lateral keel slightly raised above the general surface; wall on the body portion ornamented with a number of small pits which vary in size; aperture fissurine, elongate, and opening into an entosolenian tube which extends about half way down one face of the test and is recurved at its inner end.

Length, 0.35 mm.

This appears to be the same form as that figured by Brady from off Raine Island, Torres Strait, 155 fms., under the name of *Lagena castrensis*? It is common in Bass Strait, and, while usually occurring with *F. lacunata*, differs from this species in its apertural characters and in the weaker pitting of the surface.

62. *FISSURINA ORBIGNYANA* (Seguenza), variety (Pl. IX., fig. 7).

There are ten examples of a form of *F. orbignyana*, which in front view is pyriform, with the apertural end only slightly extended and the central portion of the test on each side bearing a white, horse-shoe shaped marking, the rounded end of which is directed towards the base of the test.

63. *FISSURINA LAGENOIDES* (Williamson) (Refs., Cushman, 1923, p. 30).

One fairly typical example.

64. *ENTOSOLENIA GLOBOSA* (Montagu) (Refs., Cushman, 1923, p. 20).

Numerous specimens. They are nearly all faintly hispid, but one has the surface thickenings developed to such an extent that it could be referred to *E. ampulla-distoma* (Rymer Jones).

65. *ENTOSOLENIA SQUAMOSA* (Montagu) (Refs., Cushman, 1923, p. 51).

One very typical specimen.

#### Family POLYMORPHINIDAE.

66. *GUTTULINA YABEI* Cushman and Ozawa (Refs., Parr and Collins, 1937, p. 192).

Two small examples.

67. *GUTTULINA REGINA* (Brady, Parker, and Jones) (Refs., Parr and Collins, 1937, p. 193).

Many specimens. A series of abnormal examples of this species from Barwon Heads has been figured by Parr and Collins.

68. *GUTTULINA LACTEA* (Walker and Jacob) (Refs., Parr and Collins, 1937, p. 195).

Rare, but typical.

69. *GUTTULINA SEGUENZANA* (Brady) (Refs., Parr and Collins, 1937, p. 196).

Rare. This is already known from the Victorian coast.

70. *GLOBULINA GIBBA* d'Orbigny, var. *globosa* (Münster) (Refs., Parr and Collins, 1937, p. 199).

Common. There are many fistulose specimens.

71. *POLYMORPHINA HOWCHINI* Cushman and Ozawa (Refs., Parr and Collins, 1937, p. 202).

Several examples.

72. *SIGMOMORPHINA WILLIAMSONI* (Terquem) (Refs., Parr and Collins, 1937, p. 205).

Two specimens. This has been previously figured by the writer from Hobson's Bay.

73. *SIGMOIDELLA ELEGANTISSIMA* (Parker and Jones) (Refs., Parr and Collins, 1937, p. 206).

Six small examples.

#### Family HETEROHELICIDAE.

74. *BOLIVINELLA FOLIUM* (Parker and Jones) (Refs., Parr, 1932, p. 223).

Several worn examples.

#### Family BULIMINIDAE.

75. *BULIMINELLA ELEGANTISSIMA* (d'Orbigny) (Refs., Brady, 1884, p. 402).

Two good examples.

76. *BULIMINOIDES WILLIAMSONIANUS* (Brady) (Refs., Brady, 1884, p. 408).

Three specimens. This species ranges from Torres Strait down the east coast of Australia and westward to South Australian waters. It is most common in shallow water.

77. *BULIMINA MARGINATA* d'Orbigny (Refs., Brady, 1884, p. 405).

Three specimens. The Australian examples are usually proportionately shorter than those from Europe.

78. *VIRGULINA SCHREIBERSIANA* Czjzek.

*V. schreibersiana*: Cushman, 1937, Cushman Lab. Spl. Publ. No. 9, p. 13, pl. 2, figs. 11-20 (gives refs.).

Several large examples. This species also occurs in Westernport Bay, Victoria.

79. *BOLIVINA COMPACTA* Sidebottom (Pl. IX., fig. 8).

*B. compacta*: Cushman, 1937, Cushman Lab. Spl. Publ. No. 9, p. 135, pl. 17, figs. 22-24 (gives refs.).

Two specimens. Cushman records this species from a number of shallow water dredgings in the tropical Pacific.

80. *BOLIVINA PSEUDOPPLICATA* Heron-Allen and Earland (Pl. IX., fig. 9).

*B. pseudoplicata*: Cushman, 1937, Cushman Lab. Spl. Publ. No. 9, p. 166, pl. 19, figs. 12-20 (gives refs.).

Typical examples are common.

81. *RECTOBOLIVINA DIGITATA*, sp. nov. (Pl. IX., fig. 10).

Test elongate, compressed, straight or slightly curved, with the margins lobulate, biserial portion with a slight median depression on each of the broad faces, uniserial portion also depressed in the upper part of the centre of each chamber; sutures distinct, often a little depressed; chambers numbering 6 to 8 in the biserial portion, with 5 or 6 in the uniserial portion; wall calcareous, smooth, fairly coarsely perforate except along the median line; aperture elliptical, with a rounded rim. Length, 0.6 mm.; breadth, 0.15 mm.

There are two examples from Barwon Heads and I have a number from the Post-Tertiary of Victorian Mines Department Bore No. 5, Parish of Wannaeue, near Rosebud, 177-187 feet. This species differs from the well-known Indo-Pacific Recent species, *R. bifrons* (Brady), in its more irregular build, greater number of biserial chambers, less compressed uniserial portion, and more coarsely perforated test.

82. *REUSSELLA ARMATA* (Parr) (Refs., Parr. 1932, p. 224).

Three examples. The only previous record of this species is from shore sand, Hardwicke Bay, South Australia.

83. *CHRYSALIDINELLA DIMORPHIA* (Brady) (Refs., Brady, 1884, p. 388).

One specimen. It is proportionately narrower and more heavily built than are the tropical examples of this species.

84. *UVIGERINA* sp. cf. *PIGMEA* d'Orbigny.

There are six specimens of the form I have recorded (1939, Mining Geol. Journ., 1 (4), p. 68, pl. fig. 14) from the Lower Pliocene of Gippsland. It is probably not d'Orbigny's *U. pigmea*, but this cannot at present be determined with certainty.



85. SIPHOGENERINA RAPHANUS (Parker and Jones) (Refs., Parr, 1932, p. 225).

Examples are frequent and typical.

86. ANGULOGERINA ANGULOSA (Williamson).

*Uvigerina angulosa* Williamson, 1858, Recent Foram. Gt. Britain, p. 67, pl. 5, fig. 140.

There are three specimens similar to examples of the typical British form of this species from Dog's Bay, Ireland.

#### Family CASSIDULINIDAE.

87. CASSIDULINA LAEVIGATA d'Orbigny (Refs., Brady, 1884, p. 428).

One small specimen.

88. CASSIDULINA SUBGLOBOSA Brady (Refs., Cushman, 1922, p. 127).

Three small specimens.

89. EHRENBERGINA PACIFICA Cushman.

*E. pacifica* Cushman, 1927, Proc. U.S. Nat. Mus., 70, Art. 16, p. 5, pl. 2, figs. 2 a-c.

One small example. This species is common off the coast of New South Wales.

#### Family DELOSINIDAE.

90. DELOSINA COMPLANATA Earland (Pl. X., figs. 1, 2).

*Polymorphina complexa* Sidebottom, 1907, Mem. Proc. Manchester Lit. Phil. Soc., 51 (9), p. 16, pl. 4, figs. 4, 8, (?) 9. Heron-Allen and Earland, 1916, J.R.M.S., p. 48, pl. 8, figs. 5-7.

*Delosina complanata* Earland, 1934, Discovery Reports, 10, p. 128.

One of the most interesting occurrences in the shore gatherings from Barwon Heads is that of numerous examples of the genus *Delosina*. The specimens are exceptionally well developed and are very variable in form. Generally, however, the chambers are almost biserially opposed on a plan similar to the chambers in the genus *Sigmomorphina*. The plan of growth is best shown in the large compressed specimens, one of which is represented by fig. 2 of Pl. X. While Earland has described the chambers as at first triserial rapidly becoming biserial and opposed, the chambers in the Victorian examples appear to be biserial from the beginning but in the early stages are separated by a greater angle than the

later chambers, giving a twisted effect to the test when viewed from the base. The Wiesner canals with the needle-stitch-like openings through which they communicate with the exterior of the test are recognisable in all specimens. There are usually a number of pits on the surface of the end of that last-formed chamber, but there is no general aperture. In one specimen sectioned, the first two chambers showed a comparatively large, rounded, terminal opening; This may, however, be due to the resorption of the end of the chamber.

According to Earland, *D. complanata* always occurs in the Mediterranean with *D. complexa* and with about equal rarity. He also records the species from South Cornwall and from off Cape Horn. This gives it a very wide distribution. In addition to the Barwon Heads examples, I have met with the species in a number of dredgings from Bass Strait, and in shore sands from the north coast of Tasmania.

The Victorian specimens are usually half as large again as those figured by Sidebottom from the Eastern Mediterranean, attaining a length of 0.75 mm.

#### Family ROTALIIDAE.

##### 91. PATELLINA CORRUGATA Williamson.

*P. corrugata* Williamson, 1858, Recent Foram. Gt. Britain, p. 46, pl. 3, figs. 86-89. Parr and Collins, 1930, Proc. Roy. Soc. Vic., n.s. 43 (1), p. 90, pl. 4, figs. 1-5.

Two examples.

##### 92. ANNULOPATELLINA ANNULARIS (Parker and Jones) (Refs., Parr, 1932, p. 225).

Many specimens.

##### 93. PATELLINELLA INCONSPICUA (Brady).

*P. inconspicua*: Parr and Collins, 1930, Proc. Roy. Soc. Vic., n.s. 43 (1), p. 92, pl. 4, fig. 7 (gives refs.).

Typical examples occur frequently.

##### 94. DISCORBIS DIMIDIATUS (Jones and Parker) (Refs., Parr, 1932, p. 227).

Common. This is the most abundant species of *Discorbis* on the southern coast of Australia.

##### 95. DISCORBIS GLOBULARIS (d'Orbigny) (Refs., Cushman, 1931, p. 22).

One example, more depressed than usual, and with a sub-carinate margin to the test.

96. DISCORBIS GLOBULARIS (d'Orbigny), var. *anglica* Cushman  
(Pl. IX., figs. 11 a-c).

*D. globularis*, var. *anglica* Cushman, 1931, p. 23, pl. 4, figs. 10a-c.

*D. irregularis* Parr (non *Discorbina irregularis* Rhumbler), 1943,  
Malac. Soc. Sth. Aust. Publ. No. 3, p. 16.

Many specimens. I previously recorded this form as *D. irregularis* (Rhumbler), which in most respects it resembles, but the specimens do not have the several apertures found on the peripheral margin of the later chambers in Rhumbler's species from the tropical Pacific.

97. DISCORBIS AUSTRALIS Parr (Refs., Parr, 1932, p. 227).

This species was described from San Remo, Victoria. It is common at Barwon Heads.

98. DISCORBIS PATELLIFORMIS (Brady) (Refs., Brady, 1884, p. 647).

This well-known Indo-Pacific species is represented by a few small examples.

99. DISCORBIS AUSTRALENSIS Heron-Allen and Earland.

*Discorbina pileolus* Brady (non *Valculina pileolus* d'Orbigny), 1884, p. 649, pl. 89, figs. 2-4 (and later authors).

*Discorbis australensis* Heron-Allen and Earland, 1932, *Discovery Repts.*, 4, p. 416. Parr, 1939, *Mining and Geol. Journ.*, 1 (4), p. 68.

This species is well known from the east coast of Australia under the name of *D. pileolus*. At Barwon Heads it occurs frequently.

100. DISCORBIS OPERCULARIS (d'Orbigny) (Refs., Brady, 1884, p. 650).

Rare.

101. DISCORBIS KENNEDYI, sp. nov. (Pl. IX., figs. 12 a, b, 13, 14 a, b).

Test depressed conical, ventral side slightly concave, periphery subacute; chambers not distinct, 4 to 5 in the last-formed whorl, regularly increasing in size, overlapping on the ventral side; spiral suture depressed in the later part of the test, chamber sutures directed backwards and slightly curved on the dorsal side, usually indistinct, almost radial and somewhat depressed on the ventral side; wall irregularly thickened so as to give an arenaceous appearance to the surface, finely perforate, the periphery limbate; aperture ventral, at the base of the last-formed chamber, opening into the umbilical depression; colour white to pale-brown.

Diameter, 0.4 mm.

There are eleven examples of this species, which appears to be a local form, as I have not met it elsewhere on the Australian coast or in material from other parts of the world. The under side of the last-formed chamber is easily broken, as every specimen is incomplete in this respect. The rough surface texture and the usually brownish colour give an appearance like that of some species of *Trochammina*. I have pleasure in associating the name of Mr. Arthur Kennedy, of the Victorian Department of Mines, with this species.

102. *DISCORBIS WILLIAMSONI* Chapman and Parr (Pl. X., figs. 3 *a, b*).

*D. williamsoni* Chapman and Parr M.S.: Parr, 1932, p. 226, pl. 21, fig. 25 (gives earlier reis.). Chapman and Parr, 1937, Aust. Antarctic Exped. 1911-14, Sci. Repts. [C.], 1 (2), p. 105, pl. 8, fig. 23.

Many examples.

103. *DISCORBIS PULVINATUS* (Brady) (Ref., Brady, 1884, p. 650).

Three typical specimens. This species is common in shallow water on the south coast of Australia.

104. *DISCORBIS BERTHELOTI* (d'Orbigny) (Refs., Cushman, 1931, p. 16).

Two small specimens.

105. *DISCORBIS RARESCENS* (Brady) (Pl. X., figs. 5 *a-c*) (Ref., Brady, 1884, p. 651).

Three examples. Brady's specimens were from off Raine Island, Torres Strait, 155 fms., and off the Philippines, 95 fms.

106. *DISCORBIS GROSSEPUNCTATUS*, sp. nov. (Pl. X., figs. 4 *a-c*).

Test plano-convex, oval, peripheral margin limbate, bluntly keeled; chambers, usually four in the final whorl the last much larger than the others; sutures slightly depressed, distinct, almost radial on the dorsal side, limbate and strongly recurved on the ventral side; wall very coarsely perforate on the dorsal side, smooth and finely perforate ventrally, with a deposit of shell material in the centre of the test; aperture not clearly visible but possibly a very low slit extending from near the periphery along the base of the last-formed chamber to near the centre of the test. The curvature of the sutures on the flat side of the test suggests that this species would be better referred to *Cibicides*.

Greater diameter, 0.65 mm.; lesser diameter, 0.4 mm.

Two specimens. I have other examples from the Middle Miocene of Mines Department bore No. 1, Parish of Yulecart, near Hamilton, 80-85 ft. This is not a typical *Discorbis*, but resembles *D. rarescens* and some of the forms referred by authors to *D. bertheloti*, in which the earlier whorls are visible only on the ventral side. The aperture cannot be determined with certainty, and it is possible that it is absent. A similar difficulty is frequently experienced in detecting the ventral aperture in species of *Discorbinella*.

107. *HERONALLENIA LINGULATA* (Burrows and Holland).

*H. lingulata*: Chapman, Parr, and Collins, 1934, Journ. Linn. Soc. (London)—Zool., 38, p. 564, pl. 8, figs. 11a-c (gives refs.).

Three typical examples.

108. *HERONALLENIA TRANSLUCENS*, sp. nov. (Pl. IX., figs. 15, 16).

Test small, suboval in outline, compressed, dorsal side more convex than the ventral which is depressed in the median portion, peripheral margin subacute and slightly keeled; chambers few, arranged in one and a half whorls, with six chambers in the outside whorl; sutures distinct, limbate, flush, recurved on the dorsal side and nearly radial on the ventral; wall smooth, finely perforate, usually translucent; aperture ventral, an elongate opening extending from the umbilical area towards the front of the last-formed chamber. Length, up to 0.35 mm.

This species is represented by two examples and it also occurs in dredgings from Bass Strait. It differs from described species of *Heronallenia* in its well-inflated test, flush dorsal sutures, and the absence of any thickening of the shell wall on the upper surface.

109. *DISCORBINELLA BICONCAVA* (Jones and Parker).

*Discorbina biconcava* Jones and Parker, in Carpenter, 1862, Intro. Study Foram., p. 201, text-fig. 32 G. Brady, 1884, p. 653, pl. 91, fig. 2 (non 3).

*Planulinoides biconcavus*: Parr, 1941, Mining and Geol. Journ., 2 (5), p. 305, text-fig. (after Brady).

There are many examples of this typically Southern Australian species. Since erecting the genus *Planulinoides* for its reception, I have recognized the presence in some specimens of the normal ventral discorbine aperture in addition to that on the periphery. *Planulinoides* should therefore be suppressed and the species referred to *Discorbinella*.

110. *DISCORBINELLA PLANOCONCAVA* (Chapman, Parr, and Collins) (Pl. XI., figs. 1, 2).

*Planulina biconcava* (Jones and Parker), var. *planoconcava* Chapman, Parr, and Collins MS., in Parr, 1932, p. 232, pl. 22, figs. 34 a-c

*Discorbis planoconcava* Chapman, Parr, and Collins, 1934, Journ. Linn. Soc. (London)—Zool., 38, p. 561, pl. 11, figs. 40 a-c.

There are sixteen examples of this species, which was described from the Middle Miocene of Victoria and also recorded as a Recent form from shore sand, Point Lonsdale, Victoria.



111. *DISCORBINELLA DISPARILIS* (Heron-Allen and Earland)  
(Pl. XI., figs. 3 *a-c*) (Refs., Parr, 1932, p. 230).

There are 22 specimens. Like the preceding species, this is a typical *Discorbinella*, with two apertures, one peripheral and the other ventral. It was originally described from off New Zealand, 100 fms., and later recorded by the writer from shore sand, Victoria, and Hardwicke Bay, South Australia.

112. *DISCORBINELLA INVOLUTA* (Sidebottom).

*Discorbinella involuta* Sidebottom, 1918, J.R.M.S., p. 255, pl. 6, figs. 15-17.

Four specimens. Sidebottom's record was from off the coast of New South Wales, 465 fms. The species is widely distributed on the east coast of Australia and in Bass Strait.

113. *VALVULINERIA COLLINSI* (Parr).

*Discorbis collinsi* Parr, 1932, p. 230, pl. 22, figs. 33 *a-c*.

Seven specimens. The original record of this species was from shore sand, Port Fairy, Victoria.

114. *TRETOMPHALUS CONCINNUS* (Brady) (Pl. XI., figs. 4, 5).

*T. concinnus*: Cushman, 1934, Contrbns. Cushman Lab. Foram. Research, 10 (4), p. 96, pl. 11, figs. 8, 9; pl. 12, figs. 13-15 (gives Brady's ref.).

Examples were very common in one gathering.

115. *TRETOMPHALUS PLANUS* Cushman.

*T. planus* Cushman, 1934, Contrbns. Cushman Lab. Foram. Research, 10 (4), p. 94, pl. 11, figs. 11*a-c*; pl. 12, figs. 18-22.

Like the preceding, this species was very common in one gathering. While the majority of the specimens have the depressed, cushion-like shape represented by Cushman's fig. 11 *b*, many are subglobular because of the deeper, more rounded balloon chamber. The number of *Cymbaloporella*-like chambers underlying the balloon chamber is usually four, but is sometimes five. Cushman described this species from off Santa, 7 fms., and he gives other records from the tropical Pacific. The genus *Tretomphalus* is, from published records, typically of tropical habitat, and its occurrence in such numbers at Barwon Heads is therefore unusual. Occasional examples of *T. concinnus* occur in Victorian shore sands and in dredgings from Bass Strait, but this is the only occasion on which I have met with *T. planus* in this area. Mr. Arthur Earland, F.R.M.S. (1902, Journ. Quekett Micr. Club, [2], 8, (51), pp. 309-322) has recorded a remarkable occurrence of *Tretomphalus* at Corny Point, on Hardwicke Bay, Spencer Gulf, South Australia. From his description, it appears that the species he had was *T. concinnus*.

116. *EPONIDES CONCENTRICUS* (Parker and Jones) (Pl. XI., figs. 6 a, b) (Refs., Cushman 1931, p. 43).

Frequent. The characters of this species suggest that it might be referred to *Mississippina* rather than to *Eponides*.

117. *STREBLUS BECCARII* (Linné) (Refs., Cushman, 1931, p. 58).

Many specimens. They do not attain the development of the species as it occurs in the Adriatic Sea, but are exactly similar to British examples Mr. Arthur Earland has sent me from Tents Muir, Fifeshire, Scotland. The usual number of chambers in the outside whorl is ten.

118. *STREBLUS PAUPERATUS* Parr.

*Rotalia perlucida* Parr (non Heron-Allen and Earland), 1932, p. 211, pl. 22, figs. 35a-c.

*Streblus pauperatus* Parr, 1941, Mining and Geol. Journ., 2 (5), p. 305.

Two examples. The previous record of this species was from shore sand, Hardwicke Bay, South Australia.

119. *NOTOROTALIA CLATHRATA* (Brady).

*Rotalia clathrata* Brady, 1884, p. 709, pl. 107, fig. 8 (non 9).

*Notorotalia clathrata*: Finlay, 1939, Trans. Roy. Soc. N.Z., 68, p. 518 (note under *N. zelandica* Finlay).

Several examples. This is a common Bass Strait species.

120. *CANCERIS* sp. (Pl. XI., figs. 7 a-c).

The figures represent what appears to be a species of *Canceris*. The test is roughly ear-shaped in outline, with a lobulated periphery. The chambers, which are inflated, increase rapidly in size as added and the sutures are well depressed. The greater part of the face of the last-formed chamber is occupied by a clear, apparently imperforate, area. The base of this is extended as a lip under which the aperture opens into the umbilical cavity. While the species is probably new, there are too few specimens available to enable its characters to be fully determined.

121. *BAGGINA PHILIPPINENSIS* (Cushman).

*Canceris philippinensis*: Parr, 1939, Mining and Geol. Journ., 1 (4), p. 69, pl., figs. 18a-c (gives refs.).

Five small specimens. This species occurs frequently in dredgings off the coast of New South Wales, at depths of about 100 fms., and is common in the Pliocene of Victoria.

122. *ANOMALINA NONIONOIDES* Parr (Refs., Parr, 1932, p. 231).

There are ten specimens. This species was described by the writer from shore sand, Narrabeen, New South Wales, and also recorded from shore sand, Torquay, Victoria.

123. *CIBICIDES LOBATULUS* (Walker and Jacob) (Refs., Cushman, 1931, p. 118).

Examples are common. In addition to the usual form of this species, there are many specimens showing a *Dyocibicides* plan of growth and three with the chambers arranged as in *Rectocibicides*. Some English examples of *C. lobatulus* also develop a biserial habit of growth, although I have not seen any with as many biserial chambers as those from Barwon Heads.

124. *PLANORBULINA MEDITERRANENSIS* d'Orbigny (Refs., Cushman, 1931, p. 129).

There are numerous examples of the very well-developed form so common in Victorian shore sands. This is possibly not the same as d'Orbigny's species.

125. *ACERVULINA INHAERENS* Schultze (Refs., Cushman, 1931, p. 134).

Several specimens.

126. *GYPSINA VESICULARIS* (Parker and Jones) (Refs., Cushman, 1931, p. 135).

Six specimens. They are almost hemispherical in shape, and are very neatly built.

127. *MINIACINA MINEACEA* (Pallas).

*Polytrema minaccum*: Heron-Allen and Earland, 1922, Brit. Antarctic ("Terra Nova") Expedn., 1910, Nat. Hist. Rept., Zool., 6 (2), p. 221, pl. 8, figs. 1-31.

Recognizable fragments only. This species is common on the coast of New South Wales.

#### Family CHILOSTOMELLIDAE.

128. *SPHAEROIDINA BULLOIDES* d'Orbigny (Refs., Cushman, 1924, p. 36).

Small specimens.

Family ORBULINIDAE.

129. GLOBIGERINA BULLOIDES d'Orbigny.

*G. bulloides* d'Orbigny, 1826, Ann. Sci. Nat., 7, p. 277, No. 1; Modèles Nos. 17, 76. Cushman, 1941, Contrbns. Cushman Lab., 17 (2), p. 38, pl. 10, figs. 1-13.

Frequent, but small.

130. GLOBIGERINA INFLATA d'Orbigny (Refs., Cushman, 1924, p. 12).

Frequent.

131. GLOBIGERINOIDES RUBER (d'Orbigny) (Refs., Cushman, 1924, p. 15).

Seven specimens. Like all other Southern Australian examples of this species I have seen, they are colourless.

132. ORBULINA UNIVERSA d'Orbigny (Refs., Cushman, 1924, p. 28).

Several examples.

133. GLOBOROTALIA HIRSUTA (d'Orbigny) (Refs., Cushman, 1931, p. 99).

This pelagic species is represented by a single example.

124. GLOBOROTALIA TRUNCATULINOIDES (d'Orbigny) (Refs., Cushman, 1931, p. 97).

Typical examples.

Family NONIONIDAE.

135. NONION DEPRESSULUS (Walker and Jacob).

*N. depressulum*: Cushman, 1939, U.S. Geol. Survey Prof. Paper 191, p. 20, pl. 5, figs. 22-25 (gives refs.).

Rare. The specimens are similar to some I have from Bognor, England.

136. NONION SCAPULA (Fichtel and Moll).

*N. scapula*: Cushman, 1939, U.S. Geol. Surv. Prof. Paper 191, p. 20, pl. 5, figs. 18-21 (gives refs.).

Four examples of the typical form of this species. The number of chambers in the last-formed coil varies from eleven to twelve.

137. *ELPHIDIUM* sp. cf. *SIMPLEX* Cushman (Pl. XI., fig. 8).

Cf. *E. simplex* Cushman, 1939, U.S. Geol. Survey Prof. Paper 191, p. 62, pl. 17, fig. 10 (gives refs.).

There are several examples of a species of *Elphidium* which may be a temperate water form of *E. simplex*, described by Cushman from off Tonga, in the South Pacific. The retral processes are better defined than in Cushman's figure, and there is no boss in the umbilical region, which is merely granulated.

138. *ELPHIDIUM* sp. aff. *ARTICULATUM* (d'Orbigny) (Pl. XI., figs. 9 a, b).

Cf. *E. articulatum*: Cushman, 1939, U.S. Geol. Survey Prof. Paper 191, p. 53, pl. 14, figs. 18, 19.

The specimens agree with *E. articulatum* in the shape and number of chambers to a whorl (10), but the test is narrower in apertural view in the earlier portion and the umbilical region is superficially thickened. *E. articulatum* was described from the vicinity of the Falkland Islands.

139. *ELPHIDIUM* *ADVENUM* (Cushman)

*E. advenum* (Cushman): Cushman, 1939, U.S. Geol. Survey Prof. Paper 191, p. 60, pl. 16, figs. 31-35 (gives refs.).

Several examples. They resemble fig. 1 of Pl. 110 of the "Challenger" Report.

140. *ELPHIDIUM* *ARGENTEUM*, sp. nov. (Pl. XII. figs. 7 a, b.).

Test comparatively large, compressed, periphery subacute with a small blunt keel, margin slightly lobulated, sides nearly parallel in front view, umbilical regions moderately depressed with the surface thickened; chambers numerous, 15-17 in the last-formed whorl, slightly inflated; sutures recurved, obscured by the retral processes, which are rod-like and fairly conspicuous, averaging about 12 in number; surface closely and finely beaded, giving a silvery appearance to the test; aperture a series of rounded openings situated a short distance above the base of the apertural face. Diameter, up to 1 mm.; thickness, to 0.35 mm.

This is the commonest species of *Elphidium* in Victorian shore sands. It is apparently the same species as that recorded by Chapman (1907, p. 141) as *Polystomella striatopunctata* (Fichtel and Moll) from a number of Victorian littoral gatherings, but Fichtel and Moll's figures show that their species is an unrelated form. Like most species of *Elphidium*, *E. argenteum* appears to be restricted in its occurrence. *E. advenum*, var. *margaritacea* Cushman, from off Rhode Island, U.S.A., shows some resemblance to it but has fewer chambers and retral processes.

141. *ELPHIDIUM MACELLUM* (Fichtel and Moll).

*E. macellum* (Fichtel and Moll): Cushman, 1939, U.S. Geol. Surv. Prof. Paper 191, p. 51, pl. 14, figs. 1-3; pl. 15, figs. 9, 10.

Several specimens.

142. *ELPHIDIUM IMPERATRIX* (Brady) (Refs., Brady, 1884, p. 738).

Three immature examples. This species appears to be confined to an area extending along the east coast of Australia from near Sydney to Tasmania.

## Explanation of Plates.

### PLATE VIII.

- FIGS. 1, 2.—*Ammodiscus mestayeri* Cushman  $\times 40$ .  
 FIG. 3.—*Webbinella bassensis*, sp. nov. Holotype.  $\times 40$ .  
 FIG. 4.—*Trochammina inflata* (Montagu).  $\times 40$ .  
 FIG. 5.—*Eggerella* sp.  $\times 65$ .  
 FIG. 6.—*Quinqueloculina baragwanathi*, sp. nov. Holotype. *a, b*, opposite sides.  $\times 40$ ; *c*, apertural view.  $\times 65$ .  
 FIG. 7.—*Triloculina bassensis*, sp. nov. Holotype. *a, b*, opposite sides.  $\times 40$ ; *c*, apertural view.  $\times 65$ .  
 FIG. 8.—*Nuculites coronata* (Millet). Biloculine specimen. *a*, front view.  $\times 40$ ; *b*, side view.  $\times 35$ .  
 FIG. 9.—*Spirillina denticulogradata* Chapman, var. *pulchra* nov. *a, b*, opposite sides; *c*, peripheral view.  $\times 65$ .

### PLATE IX.

- FIG. 1.—*Spirillina denticulogradata* Chapman, var. *pulchra*, nov. Holotype of variety. *a, b*, opposite sides.  $\times 55$ ; *c*, peripheral view.  $\times 65$ .  
 FIG. 2.—*Spirillina runiana* Heron-Allen and Earland. *a*, dorsal view; *b*, peripheral view.  $\times 65$ .  
 FIG. 3.—*Spirillina runiana* Heron-Allen and Earland. Ventral aspect.  $\times 65$ .  
 FIG. 4.—*Frondicularia cometa* Brady, var. *rufosq* Heron-Allen and Earland.  $\times 40$ .  
 FIG. 5.—*Fissurina subquadrata*, sp. nov. Holotype. *a*, front view; *b*, apertural view.  $\times 65$ .  
 FIG. 6.—*Fissurina confusa* sp. nov. Holotype. Front view.  $\times 65$ .  
 FIG. 7.—*Fissurina orbignyana* Seguenza, var. Front view.  $\times 65$ .  
 FIG. 8.—*Bolivina compacta* Sudbottom.  $\times 65$ .  
 FIG. 9.—*Bolivina pseudoplicata* Heron-Allen and Earland.  $\times 65$ .  
 FIG. 10.—*Rectobolivina digitata*, sp. nov. Holotype.  $\times 65$ .  
 FIG. 11.—*Discorbis globularis* (Orbigny), var. *anglica* Cushman. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.  $\times 65$ .  
 FIG. 12.—*Discorbis kennedyi*, sp. nov. Holotype. *a*, dorsal view; *b*, peripheral view.  $\times 65$ .  
 FIG. 13.—*Discorbis kennedyi*, sp. nov. Ventral view of another example.  $\times 65$ .  
 FIG. 14.—*Discorbis kennedyi*, sp. nov. Another example. *a*, ventral view; *b*, peripheral view.  $\times 65$ .  
 FIG. 15, 16.—*Heronallena translucens*, sp. nov. Fig. 15. Holotype. Dorsal view. Fig. 16. Ventral view of another example. Both  $\times 65$ .



## PLATE X.

- FIGS. 1, 2.—*Delosina complanata* Earland. Fig. 1, *a*, *b*, opposite sides; *c*, edge view.  
Fig. 2, *a*, *b*, opposite sides. All  $\times 65$ .
- FIG. 3.—*Discorbis williamsoni* Chapman and Parr, *a*, dorsal view; *b*, ventral view.  
 $\times 65$ .
- FIG. 4.—*Discorbis grossepunctatus*, sp. nov. Holotype. *a*, dorsal view; *b*, ventral view;  
*c*, edge view.  $\times 65$ .
- FIG. 5.—*Discorbis varescens* (Brady), *a*, dorsal view; *b*, ventral view; *c*, edge view.  
 $\times 65$ .

## PLATE XI.

- FIGS. 1, 2.—*Discorbinella planoconcava* (Chapman, Parr and Collins). Fig. 1, *a*, *b*,  
dorsal and ventral views. Fig. 2, edge view of another specimen showing  
peripheral aperture. All  $\times 65$ .
- FIG. 3.—*Discorbinella disparilis* (Heron-Allen and Earland), *a*, dorsal view; *b*,  
ventral view; *c*, edge view.  $\times 65$ .
- FIGS. 4, 5.—*Tretomphalus concinnus* (Brady). Fig. 4, side view. Fig. 5, dorsal view  
of another specimen. Both  $\times 65$ .
- FIG. 6.—*Eponides concentricus* (Parker and Jones). *a*, dorsal view; *b*, ventral view.  
 $\times 65$ .
- FIG. 7.—*Cancris* sp. *a*, dorsal view; *b*, ventral view.  $\times 40$ ; *c*, edge view.  $\times 65$ .
- FIG. 8.—*Elphidium* sp. cf. *simplex* Cushman.  $\times 65$ .
- FIG. 9.—*Elphidium* sp. aff. *articulatum* (d'Orbigny). *a*, side view; *b*, apertural view.  
 $\times 65$ .

## PLATE XII.

- FIG. 1.—*Planispirina* (?) *bucculenta* (Brady). *a*, side view; *b*, apertural view.  $\times 43$ .
- FIG. 2.—*Quinqueloculina subpolygona*, sp. nov. Holotype. *a*, *b*, opposite sides; *c*,  
apertural view.  $\times 43$ .
- FIG. 3.—*Quinqueloculina baragreanathi*, sp. nov. Front view.  $\times 43$ .
- FIG. 4.—*Uaginulina bassensis*, sp. nov. Holotype.  $\times 43$ .
- FIG. 5.—*Dentalina mutsui* Hada.  $\times 43$ .
- FIG. 6.—*Lagena distoma-margaritifera* Parker and Jones, var. *victoriensis*, nov. Holotype  
of variety.  $\times 43$ .
- FIG. 7.—*Elphidium argenteum*, sp. nov. Holotype, *a*, side view; *b*, apertural view.  $\times 43$ .



















